

# BETWEEN THE POINT OF VIEW AND THE POINT OF BEING: THE SPACE OF THE STEREOSCOPIC TOURS

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## Abstract

One of the most interesting features of the travel stereoview series is not their three-dimensional effect but rather the intertwined outcome of realism and "being-there-ness" in the experience of early twentieth century armchair travellers. On the set of *Italy through the Stereoscope*, the viewer's "path of the gaze" was a novelty compared to two dimensional photographs and stereoviews. The Underwood & Underwood publishing company created a stereoscopic multimodal tour to improve the impression of realism with a proprioceptive perception of the scene. The procedure of textual *débrayage*, the description of the experience as it is happening here and now, the direction of the viewer's gaze with a narrative itinerary, the changing of the visual convergence with the variation in the points of attention: all of these elements fostered a synaesthesia for the spectator. The result was immersion in an explorable space between the "point of view" (2D images) and the "point of being" (virtual reality).

**Keywords:** *stereoviews, immersion, multimodality, point of view, point of being*

## Introduction

We analyse the stereoscopic travel set *Italy through the Stereoscope* (published in 1903 by Underwood & Underwood), focusing on how the stereoviews extend “tactile viewing and incorporate the viewer’s embodied participation in the image space” (Ross, 2013 p. 407)<sup>1</sup>.

Before describing how this set differs from other series of stereoviews, and how the accompanying text guide directs the viewer’s gaze with a narrative itinerary inside the scene, it is necessary to briefly introduce the role of stereoscopic tours in their socio-cultural milieu.

In the second half of the nineteenth century, the successful deployment of stereoscopy was mainly ascribed to its realistic reproduction of the world (Holmes, 1859). Thanks to its quality, this visual medium was used not only for entertainment, but also for information and education (Darrah, 1964; Darrah, 1977; Silverman, 1993). During the stereoscopic-crazed entertainment boom, stereoviews entered American schools and were used for educational purposes to teach social studies, science, history, reading and geography (Apthorpe, 1908 174; Bak, 2012; Ent, 2013).

Knowledge of the world was a favoured topic. Many societies and foreign countries were represented through stereoviews with the purpose of introducing

different cultures (Malin, 2007; Vander-Knyff, 2007). Although there was a long tradition of travelling while staying in one place thanks to books and images (Stiegler, 2013), the stereoscope was introduced as the perfect device for the armchair traveller<sup>2</sup>.

Stereoscopic tours, despite being advertised as an authentic reproduction of reality, were composed (in addition to the documentation necessities) according to the narrative and entertainment needs of the audience. These works flawlessly mixed the *mimesis* and the *poiesis*, a verisimilar documentation of reality and a fictional visual narrative.

Our assumption is that the specific characteristic of these stereoscopic tours was the virtual immersion effect on the observer, as well as the 3D effect of the objects. In this paper, we will focus on how the visual point of view become a *place of being* (De Kerckhove & De Almeida, 2014), where the viewer could become an “armchair traveller” and enter into a virtual and exotic country. We investigated the choices made by author and photographer that combined technical stereoscopic needs with narrative needs to obtain the most realistic effect. This issue is significant because the syntax underlying an effective presentation of realism can still be relevant today and useful for understanding the evolution of 3D filmic storytelling (Atkinson, 2011; Ross, 2012; Zone, 2014), the 3D

television production (Mendiburu, 2012), or the aesthetics and visual grammars of the new 3D technologies (Blundell, 2011; Urey, Chellappan, Erden & Surman, 2011).

## Methodology

The methodology of this research has been interdisciplinary, interrelating the approach to the point of (De Kerckhove & De Almeida, 2014), immersion (Grau, 2004), enunciation (Greimas & Courtes 1982), and multimodality (Kress, 2010). We will focus on the salient differences of this medium (in comparison to the traditional representations of that time) that promote the effect of presence thanks to the qualities of the visual device, the 3-D binocular cues, and the multimodal rhetoric.

The observer, thanks to the stereoscope, has a precise location that is emphasised in the geometry and movements of their vision. Their location within the scene promotes an immersive narrative, which the author of the guide achieved using specific rhetorical devices. One of these is to direct the attention of the viewer, guiding their eye movements, which converge on different depth planes and create the stereoscopic effect.

*Italy through the Stereoscope* is a guidebook written by Daniel James Ellison and published in 1903 by Underwood and Underwood. It was in fact more than

a simple book: the guide was inside a package that included one hundred stereoviews and ten topographical maps (Ellison, 1903). Its purpose was to offer an immersive virtual travel experience using the stereoscope and stereoviews. *Italy through the Stereoscope* was a travel set which offered a virtual and cheaper option than the traditional upper class Grand Tour, framing this medium as an important source of culture at the beginning of the twentieth century.

There are a hundred stereoviews in the package, and the most significant subject in these images is the description of five Italian cities. The majority of the images are photographs of architecture and urban places. Rome, Florence, Venice, Naples and Pompeii become, in this representation, an open-air 3-D museum. Even though the Italian cities are mainly described as static representations without social life and the composition highlights buildings, memorials, and roads, one may notice there are some people. Their presence is interesting in examining the social relationship between the tourist and the native.

### **The “point of being” between realism and illusion**

The stereoviews produce an intertwined effect of realism and “presence” or “being-thereness”. This outcome is also found in 2-D photography and films: many scholars, from André Bazin (Bazin

& Gray, 1967) to Roland Barthes (1980), have explained the sense of “presence” as an effect of *indexicality* (Peirce, Harts-horne & Weiss, 1931). Others, like Tom Gunning, explain the photograph's impression of presence, not because there is an index, but because optical devices give delight in visual illusion through “visual acuity and excess” (Gunning, 2004).

The question of the realism of the image emerges again in stereoscopic photography: why and to what extent does the viewer consider the 3-D visual representation to be true? Surprisingly, the stereoscope was first presented as a device that deceived our senses: the first account of stereoscopy (by Sir Charles Wheatstone in June of 1838) declared this phenomenon to be an optical illusion, prompting the experience of solidity where no depth actually existed. His experiment was demonstrated using two drawings. Some years later, the combination of the 3D effect with the photographic process enhanced the realism of the latter medium. Stereoscopic photography (following the positivist theory of vision) was used in the burgeoning practice of commercial photography (West, 1996) relaying “the assumption that the subjects of sight were stable and that observation of those subjects led to accurate judgments” (Schiavo, 2003 p.113) and stereoscopy became a “tool for furnishing visual truths” (Schiavo, 2003 p.127).

The concepts of “point of view” and of “point of being” could help to distinguish between the characteristics of ordinary photographs and stereoviews. According to Derrick de Kerckhove and de Almeida (2014), there is a difference between a point of view (PV) and point of being (PB). Focusing on the psycho-physiological dimensions of the ways people experience their presence in the world, he claims that after a gradually growing hegemony of the eye, which led to the dominance of vision in perception and cognition, there was a shift from the visual to the proprioceptive and tactile.

“The contrasting metaphors of PB and PV allow one to better estimate a tactile and proprioceptive perception of the environment by opposition – or complementarity – to the PV. The latter positions the person in a spatial relationship to the environment from a specific angle within which to evaluate and judge it. (...) PB, on the contrary, is a total surround condition.” (De Kerckhove & De Almeida, 2014 p. 12)

Stereoviews are a medium that could be situated between the two poles of PV and PB. They are not an electronic or digital media and do not give the sensation of a ‘total surround condition’, but the viewers have a perception of being in the represented scene. The images used in

the stereoscope overcome the perspective, and partially anticipate the possibilities that will be permitted by the electric and digital evolution.

This state, which could be defined as an “augmented perspective”, is between De Kerckhove’s two paradigms<sup>3</sup>. In this context, *Italy through the Stereoscope* (along with other Underwood & Underwood stereoscopic tours) represents an overcoming of the representation of the Renaissance perspective (a “point of view”) and an anticipation of virtual reality (a dynamic and interactive “point of being”).

### The convergence on the point of attention

Artists, photography directors, and anyone using perspective knows that many of the technical skills in realistic two-dimensional visual composition involve using the monoscopic (or pictorial) cues of depth perception. These elements will add a third dimension to objects (without using stereoscopy): “linear perspective, apparent size, superposition, light and shade, relative motion, [and] aerial perspective” (Gibson, 1986, p. 140)<sup>4</sup>, but stereoscopy gives the viewer a perception of the space around the objects and inside the entire scene, putting the viewer inside it.

“For the first time, I could see the volumes of space between different tree branches, and I liked

immersing myself in those inviting pockets of space. As I walk about, leaves, pine needles, and flowers, - even light fixtures and ceiling pipes - seem to float on a medium more substantial than air.” (Barry, 2009).

With these words, the neuroscientist Susan Barry (who had been cross-eyed and stereo-blind since early infancy) described how she began to see in 3D at the age of 48, after intensive vision therapy. One of the wonders of stereoscopy is therefore not the 3D volume of the items but feeling the intervals between their surfaces and the illusion of potential movement inside the scene.

In 3D, there is a representation of space in which the various depth planes are clearly differentiated using objects as markers. The attention of the viewer is focused on their positions, rather than on their volume. The impression of space is obtained by the sensation of the void between the items.

This imaginary possibility that our body might move inside the image creates a sense of power and pleasure for the viewer. This feature of stereoviews is similar to gazing upon a real scene. Our brain aligns the visual spatial information about our surroundings with bodily sensation by means of a process of external mapping (Dolins & Mitchell, 2010).

*Stereopsis* is the process of obtaining a single 3-D perception from two disparate, slightly different monocular images (representing the points of view of our right and left eye). The brain uses the visual differences provided by the binocular disparity to calculate the depth and position of an object in a scene (Howard & Rogers, 1995).

In order to clearly see the scene, our eyes use two different processes to focus on distant and nearby objects: *accommodation* and *convergence*. These processes provide the so called “physiological depth cues” because they give the observer physiological information about the position of objects on the z-axis. In fact, to see a distant object, the eyes perform an accommodation: through ciliary muscle contraction, they assume a flatter shape or larger curvature. When humans accommodate to a nearby object, they also converge their vision<sup>5</sup>. The eyes rotate inward (for near objects) and became parallel (for far objects). In the real world, the accommodation and convergence work in conjunction with each other.

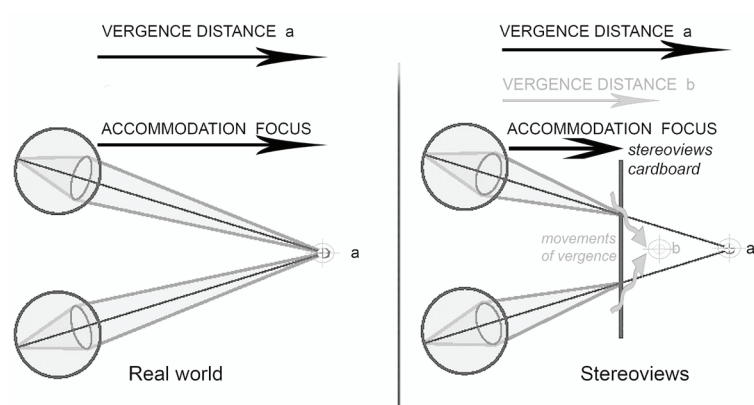


Figure 1 Vergence – accommodation process: the vision of real and stereoviews' objects. The eyes should move (converge) to fix the gaze from *a* to *b*. The accommodation remains the same.

This visual processing gives the spectator an enhanced impression of realism. Oliver Grau identified some immersive qualities of virtual reality (VR), such as real-time computation (which allows the image to change coherently and immediately, according to the movement of the user) and sensorial interactivity (which provides sounds or tactile responses to the body movement)<sup>6</sup>.

There is also a form of movement and interaction in stereoscopic view<sup>7</sup>. As Pauline Stakelon puts it, the movement of the gaze is a key issue in the stereoview tours that were produced around the turn of the twentieth century. "Stereoviews compel the spectator to continuously change their point of view within the frame. Between the frames, movement from one stereoview to the next becomes another way of experiencing travel and creating a narrative" (Stakelon, 2010 p. 407).

Some scholars have measured the eye movements of viewers while watching a contemporary stereoscopic movie. While 2D movie viewers tend to look at the actors, in 3D the focus of attention changes more often.

"The eye movements are more widely spread. The viewers' eye movements show them exploring the details of interesting three-dimensional structures present in the shots, and the initial preference to look at actors is slightly diminished" (Häkkinen, Kawai, Takatalo, Mitsuya & Nyman, 2010 p.9). This suggests that the different stereoscopic depth of 3D movies draws the attention and directs the movement of the eyes.

When we look at a 3-D image, we see a change when we turn our head from side to side: we observe a change in the elements in the scene due to a slight modification in the viewpoint. The impression

will be of seeing the object from the side. The second movement takes place in the eye. Convergence allows the eyes to find the minimum retinal disparity of the object of our attention. Our gaze must move to perceive the different planes of the scene; the difference in convergence makes us sense depth. We need to move our eyes (or converge the gazes) to clearly see our points of attention and the *wandering* of the eye is an essential element in capturing the sense of space. Both these movements (which are experiences of real-time interaction) also take place in the real world, but not when looking at ordinary images.

Visual information processing is decisive in the body's feelings. The cognitive neuroscience literature provides a wealth of evidence supporting a strong cross-modal interaction between vision and the sense of touch (Spence, 2002). There are interactions between the senses of touch and vision and between vision, posture, and proprioception to consistently represent the space around us (Berthoz & Petit, 2008)<sup>8</sup>. Our hypothesis is that stereoviews (due to implied eye movements) allow the viewer to experience a kind of synaesthesia<sup>9</sup>, which evokes their bodily presence in the scene.

Exteroception (the perception of environmental stimuli acting on the body (Gibson, Reed & Jones, 1982)) is a bodily sensation that is evoked (rather

than perceived) by visual stimuli. This sensation could be strong (for instance, in 3-D simulations of rollercoasters, the viewers may have the feeling of falling, or in movies with objects launched toward the screen and reproduced in positive parallax, the spectators may move their head to avoid the object). This sensation could also be lighter, as in stereoviews of a mountain, through which the viewer has the physical impression of the open spaces.

We argue that the key features of this stereoscopic set that distinguish it from traditional photographic books and

boost the feeling of the presence and immersion of the viewer in a realistic environment, are the specific interface of the stereoscope, the binocular vergence as a depth cue, the visual-haptic synaesthesia, and the multimodal discourse.

We do not claim that these technical, physiological, and social issues related to visual perception always produce a feeling of presence, but in a historical and cultural context they represented new sensory communicative factors compared to previous and concurrent media (e.g. 2-D photos, engravings, panoramas, silent movies).

Vision is closely tied to cognitive and cultural processes and is not merely a reflection of sensory perception amplified or reduced by the technological qualities of a specific medium. If we consider the history of the media, as Grau points out, novelty (in terms of increased sensory richness) is a catalyst for a renewed, realistic experience, but the audience, gaining media competence, soon becomes accustomed to it and looks for new features for suggestions and illusions<sup>10</sup>.

Like virtual reality (and unlike 2-D photography) the stereoscope shows the viewer the entire visual field in the image.

MEDIUM	Reality	Virtual Reality	Stereoscopic TOUR SET	Stereoviews	Image 360°	Image 2-D
DEVICE /INTERFACE INVISIBLE FROM INSIDE	YES	YES	YES	YES	NO	NO
3-D MONOCULAR CUES	YES	YES	YES	YES	YES	YES
3-D BINOCULAR CUES (accommodation, vergence)	YES	PARTIALLY (vergence)	PARTIALLY (vergence)	PARTIALLY (vergence)	NO	NO
BODY MOVEMENTS	YES	YES	PARTIALLY (synesthesia)	PARTIALLY (synesthesia)	PARTIALLY (360°)	NO
REAL TIME INTERACTION	YES	YES	NO	NO	NO	NO
OTHER SENSES	YES	PARTIALLY	NO	NO	NO	NO
MULTIMODALITY	YES	YES	YES	NO	NO	SOMETIMES

Table 1. Comparison of features supporting immersion among stereoviews and other media

They do not see the borders of the scene, fostering the illusion of immersion in another place<sup>11</sup>.

## Multimodal discourse

We used the term *multimodal discourse* to emphasise that meaning in texts and in interpersonal communication is constructed not only from verbal language but also through sounded speech, gestures, body posture, facial expressions, gazes, interpersonal physical distance, stances, the use of referenced objects and artefacts, movement (or stasis), images, music, and combinations of any of these (Kress, 2010). Here we will use the multimodal approach to focus on the interaction of stereoviews, guide and maps<sup>12</sup>.

In the *Italy through the Stereoscope* set, there are three types of media that complement each other: stereoviews, texts (the written guide, plus the captions on the front and the descriptions on the back of the stereoviews), and maps (which identify the specific point of view of the photographs). While the function of text on the front and back of the photographs is typically to describe the places, the guide (which includes the narrative, historical and artistic context of the place) furnishes a meta-communication (Bateson, 1972) about how to use these media together to achieve the maximum immersive effect.

The text directs the viewer's gaze inside each stereoviews. The user is invited to move their eyes carefully, paying attention to different details. In this way, they are able to feel the space inside the images, resulting in increased feelings of realism and immersion.

Albert Osborne, in the introduction to the set, writes:

*Noticing small details is another important means of securing the proper state of mind. Nothing is more effective in fixing a person's attention, of making him entirely oblivious to his bodily surroundings, and giving him a vivid sense or consciousness of being in the very presence of the place itself. (Ellison, 1903 p. xxxvi)*

D. J. Ellison, the author of guide, provides information in present tense about places that the gaze of the virtual observer could or could not see (because is too distant or in another direction). He thus fosters the impression of a point of being.

The author adopts an evident procedure of *débrayage* (Greimas & Courtes 1982). The concept of *débrayage*, proposed by Émile Benveniste and developed by the French theoretician Algirdas Julien Greimas (Greimas & Courtes 1982, p.88-9) in his generative semiotics, could reveal

the intersubjective linguistic space of the enunciation. *Débrayage* (disengagement) is the procedure by which an uttering subject detaches the enunciation (the text) from the situation of enunciating (the not here and not now). This mechanism projects the resulting categories of subject, place, and time into another space (the "we", "here", and "now" of the Italian stereoview descriptions). This type of framing creates an illusion of co-presence and contemporaneity between the person making the enunciation and the reader-viewer of the guide. The *débrayage* is enriched by a narrative description, suggesting a visual path inside the scene in order to notice relevant "small details".

An example can be seen in the text of Stereoview n. 44. The caption is: "Along the Appian Way Constructed 4th Century B. C., from Rome to Brindisi". We have highlighted those parts of the sentences conveying meanings of seeing or focusing on (italics) and those indicating where to look (underlined). The author writes:

What changes the centuries bring! If Julius Caesar should rise from his grave, he would scarcely recognize this as the renowned military road of the Romans; indeed, the only thing by which he could identify it at all would be that imposing round



tower rising so majestically on the summit of the road, the Tomb of Csecilia Metella (...)

The street-cleaning brigade has evidently been doing good service here, as is shown by the heaps of dirt ranged along the side of the roadway (...)

The little stone house standing just to our left, sadly in need of

whitewash, is an interesting establishment. It is a wine-shop (...)

Here we have some neighborhood gossip dispensed on the doorstep; and, at the corner, an interesting conversation is being carried on, but the most interesting person in sight is the little girl who stands in front of us with her raven locks stealing out from under her tightly fitting

headdress and her crumpled apron which looks as roguish as herself. (Ellison, 1903 p. 289)

These words (leaving out the cultural implications<sup>13</sup>) force us to look closely at the stereoviews to identify the details described. In this scene, the viewer is invited to observe different points. The path of the gaze starts from the farthest object from the viewpoint: the tomb (1), then moves on the cleanliness of the road (2), then the inscription on the corner of the house (3), then to the boy and woman (4), and finally to the little girl who looks into the camera (5-6).

The observation time (longer than the average 2D photographs) allows a better perception of the depth. We argue that the slowness with which the observer looks at the image and the comparison of objects at different distances allows them to increase their stereoscopic perception. The convergence on different objects allows the viewer to better estimate their relative positions (also in relation to the camera), and supplies the viewer with cues that are useful for the visual perception of overall space depth.

The topographic maps also show where and in which direction the stereo-camera (and the author) stood. The panorama in front of the eyes of the armchair traveller is not just a point of view: the mental mapping of the sight-seeing position



Figure 2 Scheme of Stereoviews n. 44 of *Italy through the Stereoscope* by Underwood and Underwood, 1903. The numbers mark the points of attention mentioned in the text.



helps the viewer to be virtually immersed in the city.

Primarily, it is found that we must treat the stereograph as we treat the place. (...) On these maps we find indicated the point from which each scene is photographed, and by two red lines which diverge from each point the territory included in each particular stereograph is shown. Thus a person looking at a scene in the stereoscope is enabled to know precisely where on the earth's surface he is standing, over precisely what part of the earth he is looking, and hence he can know also from the maps what his surroundings must be. (Ellison, 1903 p. xxx)

## The representation of society

A viewer, using the double image, could more easily imagine that a visualisation was from a person, rather than from a mechanical device, and identify himself in that point of view<sup>14</sup>. The rationale is that if the viewer feels a strong relationship between the point of view of the observer and the object of attention in the scene, the image must also be "real".

Scholars who take a sociological approach, claim that these stereoscope companies framed the stereoscopic perspective in an especially white, mid-

dle-class way of looking at the world (Malin, 2007 p. 404). According to Brenton Malin, Underwood & Underwood, the publisher of *Italy through the Stereoscope* and many other domestic and international stereoscopic tours, offered a cheaper option than "upper-class travel which they framed as an important source of enlightenment and cultivation" and which remained beyond the reach of a great number of Americans (Malin, 2007 p.410).

The author of these stereoscopic tours, in describing the history and art of the monuments photographed, acquired a credibility that he also used in the visual definition of who the residents were and how they behaved (their social and cultural identity). Their image (and its meaning) became a collective representation of the supposed local "ideal type", underpinned by the authority of the narrator. The representation of space and the relationship between those who looked through the camera's viewfinder and those who were photographed became a metaphor for social relationships between tourists and residents.

Through the instructions for using the stereoscope and the rhetoric used in the guide, these photographic tours wanted to enable the viewer to identify themselves in the virtual space.

The relationship between photographer and the foreign society in the stereoviews became *spatially* significant (Hall, 1969).

The proxemic representation of Italians in the scene creates (for the spectator) a verisimilar and normative touristic gaze towards the native and suggests the proper social relationship. As Brenton Malin attests, the aim is to identify the viewer with the real leisure-class tourist.

Daniel Ellison, the author of *Italy through the Stereoscope* does not pretend that the stereoviews are equal to real places, but that the "mental experience" between the tourist in the real scene and the spectator in front of stereoviews is only "a difference in quantity or intensity, not a difference in kind" (Ellison, 1903 p. XVI). The thoughts, the feelings, and the emotions of looking at stereoviews are the same as those experienced in the presence of the real scene.

We are given the impression of immersion (as if our body is inside the image), and yet at the same time we know the view is from another observer (the photographer): the text lets us know we are seeing through the photographer/author's eyes; we have their thoughts and we feel their emotions.

## Conclusion

**The space of stereoscopic tours was between the "point of view" and the "point of being".**

This analysis of *Italy through the Stereoscope* shows that the rhetorical strate-

gy of the author helps to overcome the “augmented perspective” of ordinary stereoviews, fostering the impression of immersion. We have discussed the problem mainly from the point of view of perception but also using an enunciatory and multimodal approach: the narrative creates a dynamic path for the gaze of the viewer. This mechanism enhances the 3D effect, the realism of spectator experience and, combined with the other means (e.g. topographical maps, historical information), strengthens the credibility of the cultural assumptions about a foreign country.

A specific characteristic of this set (and other Underwood & Underwood Tours) is not only the representation of depth, but also the idea that the observer should play an active role (as in virtual reality). The viewer is prompted to move (directed by the words of the text) into that scene, following an upper-class virtual travel tour. The stereoscope and the text, thanks to the specific nature of the immersion effect, facilitated the identification of the viewer as an ideal tourist who watched ideal people, but keeping historical monuments and exotic landscapes in verisimilitude.

These stereoviews could evoke the impression of incongruity in a spectator: the viewer is asked to take an active role (to virtually move inside the 3D image in order to maximise the immersion effect), but at the same time, they cannot

be autonomous. The “armchair tourist” is forced to remain fixed and distanced from the guided tour and to look at the landscapes and natives, adopting the visual and the cultural point of view of the author. We argue this is a sign of the degree of naturalism of this medium: the “reality” and its representation were blurred.

## Endnotes

- 1 This article focus on the immersive effect, and how the visual and verbal rhetoric, coupled with the physiological prompts, drive the reader-viewer’s perceptions. An analysis of Italy through the Stereoscope from a cultural studies perspective is developed in Parmeggiani (2016). The paper focuses on the relationships of this stereoscopic set to the historical and social-cultural context (e.g. tourism practices, colonial cultural assumptions, and stereotypes), with other immersive visual media, and with the standardisation of style.
- 2 Italy was one of the destinations (Fanelli, 2001; Zotti Minici, 2003; Manodori Sagredo, 2003; Anselmo, La Cecla, & Lo Dico, 2008; Stakelon, 2010), but many other foreign lands were represented in the catalogue of the Underwood & Underwood publishing company (Darrah, 1964).
- 3 We believe that the history of the media could be described as a continuum between different poles, rather than the polarisation of two concepts.
- 4 For example, the motion parallax cue is a well known (Wade & Wade, 2000 p. 354) three-dimensional effect used also in the Walt Disney movie animation process with the “multiplane camera”. The scene gains the illusion of depth by filming (frame by frame) various artwork layers (partially transparent) moved at different speeds (Disney, 2008).
- 5 A *convergence* is the simultaneous inward movement of both eyes toward each other when viewing an object, in an effort to maintain single binocular vision (Cassin & Rubin, 2012).
- 6 In spaces of illusion, the moving observer receives an illusionary impression of space by focusing on objects that move toward or away from them. The depth of a painted space, however, is experienced, or presumed, only in the imagination. Gosztonyi defines the experience of space as follows:

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- "The virtuality of the movement must be emphasized; one can also "enter" the space virtually, i.e., in thought or imagination, whereby the distances are not actually experienced but rather assumed." The technical idea that is virtual reality now makes it possible to represent space as dependent on the direction of the observer's gaze: the viewpoint is no longer static or dynamically linear, as in the film, but theoretically includes an infinite number of possible perspectives (Grau, 2004 p. 16).
- 7 This interaction is limited, compared to the real-time computerised interaction of virtual reality, although it is greater than in 2-D images.
- 8 Vision also includes cognitive judgments (which are sometimes incorrect, as in optical illusions) based on automatic habits. Information from the optical, vestibular, and somatosensory systems is also processed in an integrated way to produce a consistent sensation (Gibson, 1966). Cross-modal integration is obviously very useful for making inferences about objects and events in our environment. It seems, however, that this involves more than pathway convergence. In fact, there is a large body of evidence suggesting that activity in unimodal brain areas is modulated by information coming from other senses (e.g. Macaluso & Driver, (2005), Martinez-Conde, Macknik, Martinez, Alonso, & Tse, (2006 p. 272).)
- 9 Here we use the term synaesthesia to describe cross-modal correspondences and associations, not the strong synaesthesia (Martino & Marks, 2001).
- Synaesthesia is a condition in which stimulation in one modality also gives rise to a perceptual experience in a second modality. In two recent studies, we found that the condition is more common than previously reported; up to 5% of the population may experience at least one type of synaesthesia. Although the condition has been traditionally viewed as an anomaly (e.g. a breakdown in modularity), it seems that at least some of the mechanisms underlying synaesthesia

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- sia do reflect universal cross-modal mechanisms (Martinez-Conde et al., 2006 p. 263).
- 10 The reactions of early cinemagoers to silent black and white films tax our imagination and seem explicable only in terms of the novelty of the medium of illusion and its then unknown potential for transitory suggestive effects. (...) When a new medium of illusion is introduced, it opens a gap between the power of the image's effect and the conscious/reflected distancing in the observer. This gap narrows again with increasing exposure and there is a reversion to conscious appraisal(...) This process, where the media of illusion and the ability to distance oneself from them compete, has been played out time and again in the history of European art, since the end of the Middle Ages (Grau, 2004 p. 152).
- 11 The author of "Italy through the Stereoscope" argues that "by the peculiar construction of the stereoscope, the observer is shut away entirely from this country, from the room in which he is sitting" (Ellison, 1903 p. xv).
- 12 We use the term discourse (instead of text) to highlight how the author of Italy through the Stereoscope directs the reader to use a set in which the reader is put inside a social relationship with the author and the residents of the places visited.
- 13 This type of language ("sadly in need of whitewash", "looks as roguish") reveals many layers of cultural implications concerning the framing of Italy via the Grand Tour rhetoric; it establishes its identity as undeveloped, primitive, and immature, with a racist attitude (Malin, 2007). In many of the Underwood & Underwood's Stereoscopic Tours (as in other coeval media), foreign countries are portrayed with signs of colonial influence (Parmeggiani, 2016, p. 237).
- 14 This sensation is less evident in traditional photography and the viewer is accustomed to ignoring the 2-D photograph's standpoint. In the stereoviews, conversely, the observer could often *feel* its point of view as unquestionable and surprising, because it could

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evoke their virtual body in that scenery. This effect is even more clear and emphatic in some 3-D films, which use objects that seem to pop out of the screen and invade the personal space of the spectator. Mirian Ross, analysing the recent 3D blockbuster "Avatar" (2009) and comparing 2D and 3D moving images, argues these are traditional, haptic or *hyperhaptic* visualities (Ross, 2012). The effect of surprise is caused by a positive parallax; in other words, an object appears not behind the screen (as with a negative parallax), but in front of it, emerging over the plane of the stereo window (the screen plane).